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Why Fat Tests Vary

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WHY FAT TESTS VARY

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Butterfat content of milk from individual cows as well as herds, varies from day to day and season to season for numerous reasons. Because of these frequent variations, the accuracy of butterfat tests is often questioned.

Fat test variations may be better understood by examining the reasons for them. Some of these differences originate on the farm, while others are caused at the milk plant.

FARM CAUSES FOR VARIATION IN TESTS

Breed. Breed differences account for the greatest variations in fat content of milk. Average fat tests for the leading breeds of cattle are: Jersey, 5.4%; Guernsey, 5.0%; Ayrshire, 4.0%; Brown Swiss, 4.0%; and Holstein, 3.4%.

Individuality. Within breeds there is a wide range in fat content of milk from individual cows. D.H.I.A. records for 1958 contain frequent differences as large as plus or minus one percent for individual cows within breeds. Abnormal conditions may cause even greater variation. For a large herd, tests usually average close to the breed average. Tests within breeds vary more than between breed averages.

Feed. Changes in kind or quality of feed, produce only temporary changes in the composition of milk. When cows become adjusted to a feed change there is a gradual return to normal milk composition.

Season and weather. Higher milk yields during summer months are generally accompanied by lower tests, and lower

milk yields during cold weather are usually accompanied by higher tests. Even when cows have been on one ration throughout the year, the same seasonal variation in milk tests has occurred as when cows have been changed from dry feed to pasture. These seasonal changes in fat content are usually related to temperature. Some investigators have reported a 0.2 percent increase in fat content for each 10 degree decrease in temperature within the range of 72 to 27 degrees Fahrenheit. Abnormal weather during any season may contribute to test fluctuations. Exceptionally cold or hot weather may cause test decreases.

Lactation. Milk tests for individual cows are generally lowest when the cow is producing the largest volume of milk. Fat test usually declines until the second or third month of lactation and then gradually increases to the end of the lactation period.

Age. There is a slight decrease in fat test with increased age. In the long run, however, this has relatively little influence on the fat content.

Management. Failure to use uniform milking practices is one of the principal causes of fat variations due to farm management. Uniform milking methods are essential. Steps to stimulate milk letdown should be used, such as washing the udder in warm water, as well as rapid and thorough milking at a given standard interval after milk letdown has been stimulated. Poor practices may result in early stimulation of milk letdown and milking after the milk letdown hormone has decreased in the blood. Under such conditions a smaller quantity of milk is obtained and the fat content of the milk is lowered. The first milk drawn from the udder may test as low as 1 percent butterfat while strippings may test from 7 percent to 10 percent butterfat.

Daily variations. The fat content of normal milk from some herds varies a great deal from day to day. Figures 1, 2, 3 and 4, illustrate variations in daily fat content of four producers shipping to a single Indiana plant during a 15-day

compositing period. The data presented in Figures 1 and 2 show two relatively small producers with considerable differences in daily variation. Figures 3 and 4 present daily variations of much larger producers. Every-other-day delivery used with bulk milk cooling and pick-up, lessens the extremes. Data presented in Table 1 indicate a trend toward less daily variation with larger producers.

Environment. Dairy cows should be protected during milking, from extremes of temperature, sudden environmental changes such as storms, and undue excitement or annoyances because these factors can affect milk fat content.

Other causes of test variation. A representative fat sample cannot be obtained from frozen milk. On the other hand, milk shipped at a temperature above 50 degrees Fahrenheit, is likely to become churned during transit, rendering it impossible to sample accurately. Poor health also affects fat test and the amount of milk given, as well. Mastitis, for example, generally causes a decline in fat tests.

Figure 1. Producer shipping 102-139 pounds of milk daily, 4.1-5.0 daily test variation.

April	#Milk	Test %
1	102	4.8
2	104	4.9
3	113	4.1
4	107	4.6
5	109	4.4
6	111	4.3
7	106	4.3
8	121	4.5
9	113	5.0
10	127	4.2
11	139	4.1
12	123	4.4
13	115	4.4
14	121	4.6
15	110	4.4
Lbs. of Milk:	1,721	
Lbs. of Fat:	76.88	
Average Test:	4.47	

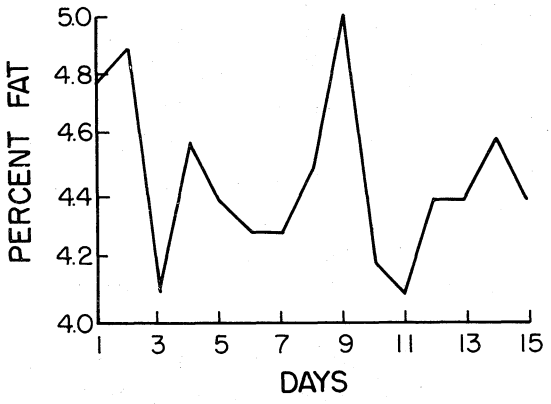

Figure 2. Producer shipping 107-127 pounds of milk daily, 4.7-5.0 daily test variation.

April	#Milk	Test %
1	122	4.9
2	114	4.9
3	126	4.7
4	114	4.8
5	116	4.7
6	117	4.9
7	125	4.8
8	107	4.8
9	126	4.8
10	109	4.7
11	119	4.7
12	114	5.0
13	124	4.7
14	127	4.8
15	125	4.8

Lbs. of Milk: 1,785
Lbs. of Fat: 85.68
Average Test: 4.80

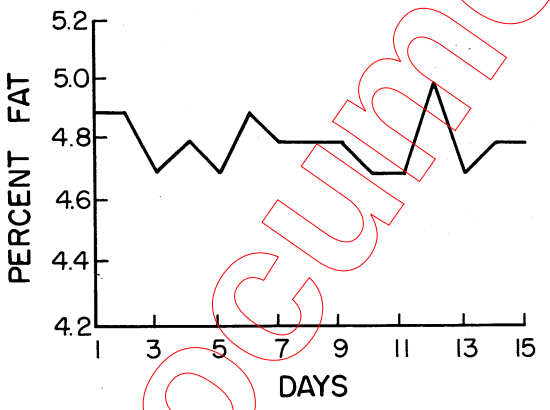

Figure 3. Producer shipping 792-877 pounds of milk daily, 3.3-3.8 daily test variation.

April	#Milk	Test %
1	870	3.7
2	868	3.5
3	859	3.5
4	877	3.6
5	845	3.5
6	843	3.6
7	839	3.8
8	801	3.5
9	819	3.7
10	792	3.7
11	822	3.7
12	850	3.5
13	855	3.3
14	848	3.4
15	862	3.6

Lbs. of Milk: 12,650
Lbs. of Fat: 451.61
Average Test: 3.57

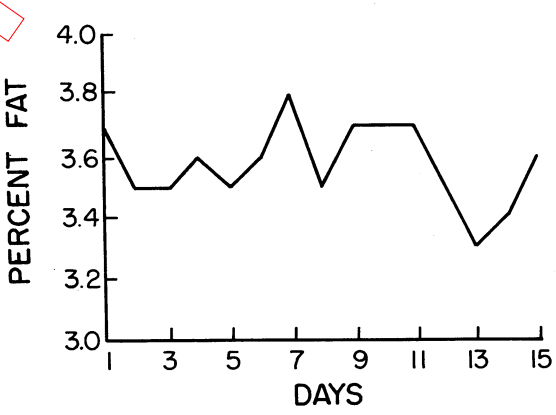

Figure 4. Producer shipping 996-1,150 pounds of milk daily, 3.4-4.0 daily test variation.

April	#Milk	Test %
1	970	3.7
2	1,060	3.6
3	1,044	3.4
4	1,070	3.5
5	1,087	3.4
6	1,139	3.4
7	1,026	3.7
8	1,076	3.5
9	1,057	4.0
10	1,015	3.8
11	996	3.7
12	1,062	3.5
13	1,097	3.5
14	1,090	3.7
15	1,150	3.6
Lbs. of Milk:	15,939	
Lbs. of Fat:	573.80	
Average Test:	3.60	

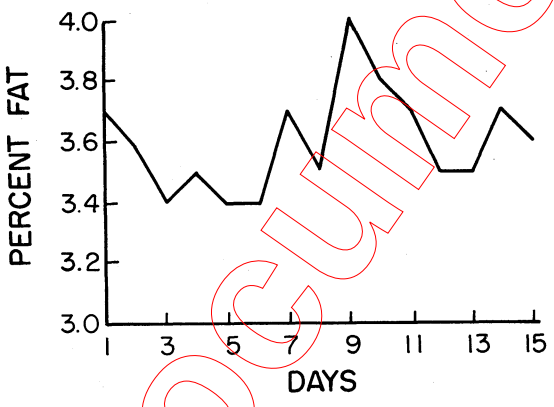

Table 1. Range of daily test variations for 90 producers during a 15-day period.

Daily weight of milk shipped	Number of producers	Range of variation in daily tests of individual producers		
		0.3 to 0.5%	0.6 to 0.8%	0.9 to 1.3%
		Percent of all producers		
Less than 200#	21	33	29	38
200 to 400#	46	45	44	11
Over 400#	23	57	43	0
All producers	90	46	40	14

PLANT CAUSES OF VARIATION IN TESTS

The causes of fat test variations at the plant can be grouped into four general areas: (1) milk condition, (2) receiving practices, (3) sampling practices, and (4) testing procedures.

Milk condition. Accurate tests are based on representative samples. Abnormal conditions of milk, such as being frozen, churned, soured or curdled, result in inaccurate samples. Such milk should not be sampled. Plants should attach a tag to the producer's milk can to notify him of any abnormal condition observed.

Receiving practices. Carelessness of receiving room personnel, such as inadequately draining cans, spilling, and failing to take daily samples, can cause inaccurate tests. A major cause of fat test variations in receiving rooms is the use of improperly constructed weigh cans. Weigh cans should be checked periodically by dairy plant operators to make certain milk is adequately blended. Mechanical agitation is necessary if evidence of poor mixing is found.

Sampling practices. Milk must be sampled at the time of each delivery if composite tests are to be representative of all milk delivered. Timing is important in sampling. All milk must be completely drained from the last can in the delivery before samples are withdrawn from the weigh tank. The force with which milk is dumped into weigh tanks can cause variation in the blending action.

Weigh tanks generally do a better blending job if they are not filled to capacity. When more milk is received from a single producer than can be weighed at one time, the milk should be divided into two lots of approximately equal size. Each tank in a double dump should be sampled.

Mishandling of samples during the receiving operation contributes to test variations. Milk samples should be: (1) refrigerated at a temperature between 35 and 50 degrees Fahrenheit at all times, (2) removed from refrigerated stor-

age only long enough for sampling (never over one hour), and (3) subjected only to very gentle handling. Excessive agitation can cause churning especially when milk is warm. Higher temperatures speed fat digestion by enzymes in the milk and growth of spoilage microorganisms.

Testing procedures. Among test procedure errors contributing to fat test variations are: (1) improper blending of samples prior to pipetting, (2) failing to cool milk in the test bottles prior to addition of acid, (3) using acid of improper strength or temperature, or an incorrect amount of acid, (4) failing to start agitation of samples immediately after addition of acid, (5) using a centrifuge operating at an improper speed or temperature, and (6) using inadequate light in reading tests. Testing procedures outlined in the latest edition of Purdue University Station Circular 78 should be followed.

Accuracy of Indiana dairy plant testing is checked at frequent intervals by the Creamery License Division of the Purdue Agricultural Experiment Station. About 90 percent of all tests checked during 1958 agreed within 0.1 percent; and 71 percent were in agreement.

D. H. I. A. VERSUS PLANT TESTS

Check testing agencies, plant fieldmen and producer cooperative fieldmen frequently hear complaints that plant tests do not agree with D. H. I. A. tests. A study of Figures 1 through 4 should show why they often do not agree. Few daily tests are in exact agreement with the average daily tests for a composite period. Besides the reasons already mentioned, such factors as more complete milking on the day of the D. H. I. A. test, removal of milk for calf feeding or home use, and testing errors also contribute to differences.

ACCURACY OF COMPOSITE SAMPLES-

A properly prepared composite sample, carefully watched and accurately tested, will check closely with the average daily test of fresh milk. In a recent comparison of 93 producers shipping to one plant, the average test of 3 sets of 10-day composites was 4.244. Daily fresh milk tests for the same 30-day period averaged 4.238.